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INSECTS ASSOCIATED WITH WEEDS IN THE NORTHEASTERN UNITED STATES. III. CHICKWEED, *STELLARIA MEDIA*, AND STITCHWORT, *S. GRAMINEA* (CARYOPHYLLACEAE)

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Abstract.—156 species of phytophagous and pollinating insects and 3 phytophagous mites are associated with the introduced Eurasian chickweeds, *Stellaria media* L. (Cyrillo) and *S. graminea* L. in the northeastern United States. Among these are 16 crop pests, including three known vectors of crop viruses that also infect *S. media*. Pollinators are primarily Apoidea, Syrphidae and Formicidae. The collection of *Tmetothrips subapterus* (Haliday) on *S. graminea* represents the first Western Hemisphere record. *Stellaria media* ranks among the ten most important weeds in the United States. A biological control program is possible, although it may be difficult due to the habit and habitat of this winter annual.

A survey of phytophagous insects of the introduced common chickweed, *Stellaria media* (L.) Cyrillo, and stitchwort or little starwort, *S. graminea* L. was undertaken to determine the trophic niches occupied by North American insects before initiating foreign exploration for possible biological control agents.

Stellaria media is a weed associated with people in Europe since prehistoric times (King 1966). It is now ubiquitous (Coquillat 1951), occurring in moist, fertile, disturbed soils throughout much of the world including the tropics (Hultén 1970), where it may occur as a winter annual during the cool season or at high elevations (Chopra et al. 1956; Cardenas et al. 1970). Chickweed is a very variable, polymorphic species (2n = 28, 40, 42, 44; Darlington and Wylie 1956; Blackburn and Morton 1957) with several ecotypes (King 1966), subspecies and varieties (Hultén 1970). In the temperate zones it is a winter annual or biennial. The plants germinate in late summer, grow during fall, and remain green throughout winter, while surviving −12°C temperature (due to high cell sugar content), and producing fertile seeds in the cleistogamous flowers (King 1966). Rapid growth and open pollination begin in early spring; most plants die before midsummer. The winter growth of *S. media* resembles that of arctic *Stellaria* spp. (Bell and Bliss 1977). This suggests that chickweed may be a post-glacial relict, perhaps originally occurring on nutrient-rich moraine deposits, later becoming associated with human refuse dumps, and as agriculture developed, invading fertile fields. Chickweed requires neutral soil pH (Buchanan et al. 1975), a high nitrogen level (King 1966), and is sensitive to phosphorous deficiency (Hoveland et

al. 1976). The small seeds are transported by ants (King 1966). They can remain viable while buried under 27.0 or 7.5 cm of soil for 32 or 58 years, respectively (Harper 1960). Optimal seed depth for germination is 0.5 to 1 cm; maximum is 2 cm; alternating temperature (20–30°C) is beneficial (Andersen 1968; Thompson et al. 1977). Viable seeds in soil may reach densities of 12.5 million per hectare (4 Kg.) in pastures, and 24.6 million per hectare in arable areas (King 1966); chickweed seed is also abundant in marshland soils (Hunyadi and Pathy 1976). Individual plants may produce 2,200–2,700 seeds (Kavanagh 1974). Although Mulligan and Kevan (1973) found no insects visiting the small, white autogamous flowers of *S. media*, Mitchell (1962, 1966) lists 34 bee species in 10 genera on *Stellaria*. Philipp (1975) found that seed setting in the self-fertile, arctic *S. longipes* Goldie was enhanced by frequent visits by insects; the alpine species, *S. cerastioides* L., is pollinated by empid, muscid and syrphid flies (Müller 1881). *Stellaria media* flowers in early spring are an important food source for many bees, wasps and flies (Table 1); *S. graminea* flowers in summer also attract many insects (Table 1; Müller 1881).

Common chickweed ranks among the ten most important weeds in the United States (Jansen et al. 1972), where it is widespread (Fernald 1970). It is a major pest in wheat, small grains, legume seed crops, and potatoes; in vegetables such as asparagus, legumes, root crops, greens, salad crops and cole crops; also in stone fruits, ornamentals, lawns, turf, hay and pastures (Vengris 1953; Jansen et al. 1972). Chickweed invades 26 crops in 40 states, particularly in the northeast and south; and it occupies over 2.8 million acres of cultivated cropland (Jansen et al. 1972). The rapidly growing plants in early spring effectively compete with crop seedlings for nutrients, water and light (Welbank 1963; Gibson and Courtney 1977); however, chickweed may be used to suppress the growth of bindweeds in vineyards (Stalder et al. 1977). In Europe it invades overgrazed pasture (Haggar 1974), dominates recently uncultivated land (Covarelli 1976), and is abundant in crops such as winter and spring cereals, barley, wheat, oats, pulses, linseed and carrots (Granström and Almgard 1955). Common chickweed in row crops is controlled by various herbicides (Aldrich 1957; Gummesson 1976; Parochetti and Bell 1975).

Stellaria graminea, a perennial and also native to Eurasia, occurs in grasslands in north central and northeastern North America (Fernald 1970). In Quebec it occurs in cultivated fields, but it is more abundant in cereals, young and old meadows (Hamel and Dansereau 1949). In eastern Europe it is common in prairie (Hruska-Dell'Uomo 1976) and floodplain meadows (Shcherbach 1977). There are three European cytotypes: diploids (2N = 26); triploids (2N = 39) and tetraploids (2N = 52; Gadella 1977). The triploid plants are male-sterile and do not produce viable seed; although not previously reported outside the Netherlands (Gadella 1977), I often found

Table 1. Insects and mites associated with *Stellaria*. Relative frequency: C, commonly collected at most locations; M, moderate abundance, collected at 3–5 locations; R, rare, only 1 or 2 specimens or found at less than 3 locations; —, not collected. Plant parts affected: F, flower; L, leaf; S, stem; Rt, root. Remarks: P, pollen feeder; N, nectar feeder; V, vector of crop viruses. Numbers refer to months of collection.

	Relative frequency on			
	S. media	*S. graminea*	Plant part affected	Remarks
ACARINA				
Tetranychidae				
Bryobia praetiosia Koch	C	—	L, S	4, 5, 10
Tetranychus sp. immatures	R	—	L, S	11
Tetranychus urticae Koch	R	—	L, S	11, Pest
COLEOPTERA				
Cantharidae				
Cantharis sp.	R	—	L, S	5
Chrysomelidae				
Disonycha sp. larvae	C	—	L, S	6, defoliates
Oedionychis sp. larvae	—	M	L, S	7
Phyllotreta sinuata (Stephens)	R	—	L, S	6
Curculionidae				
Hypera sp. larvae	—	M	S	7
Idiostethus sp.	—	R	S	7
Odontocorynus scutellum-album (Say)	—	M	F	6, P
Dermestidae				
Anthrenus scrophulariae (L.)	—	R	F	7, P
Elateridae				
Conoderus bellus (Say)	R	—	Rt	5
Nitidulidae				
Glischrochilus quadrisignatus (Say)	R	—	F	5
Meligethes nigrescens (Stephens)	M	—	F	5, Pest
COLLEMBOLA				
Entomobryidae				
Lepidocyrtus alleghaneyensis Maynard	M	—	S, Rt	4
Isotomidae				
Isotoma viridis Bourlet	R	—	S, Rt	4
Proisotoma minuta Tullberg	R	—	S, Rt	4
Poduridae				
Xenylla grisea Axelson	M	—	S, Rt	4
DIPTERA				
Acalyptratae				
Acalyptrate sp.	—	R	L, S	7

Table 1. Continued.

	Relative frequency on			
	S. media	*S. graminea*	Plant part affected	Remarks
Agromyzidae				
Agromyzid larva	R	—	L	7
Melanagromyza buccalis Spencer	—	R	F	7
Anthomyiidae				
Hylemya platura (Meigen)	M	—	F	3, 4, N
Pegomya sp. larvae	R	—	L, S	10
Anthomyzidae				
Anthomyza sp.	R	—	F	6
Mumetopia occipitalis Melsheimer	C	—	F	4, 6, N
Calliphoridae				
Phormia regina (Meigen)	R	—	F	4, N
Chloropidae				
Elachiptera erythropleura Sabrosky	M	—	S, Rt	6
Elachiptera nigriceps (Loew)	R	—	S, Rt	6
Hippelates dissidens (Tucker)	M	—	S, Rt	4
Monochaetoscinella nigricornis (Loew)	R	—	S	6
Olcella trigramma (Loew)	C	—	S, Rt	6
Oscinella carbonaria (Loew)	C	—	S, Rt	4, 6, Pest
Oscinella melancholica Beck	M	—	S, Rt	6
Oscinella soror (Macquart)	C	R	S, Rt	6, Pest
Oscinella umbrosa (Loew)	R	—	S, Rt	6
Drosophilidae				
Drosophila busckii (Coquillett)	R	—	S, Rt	10
Orthocladiine larvae	C	—	S, Rt	6
Scaptomyza adusta (Loew)	M	—	S, Rt	3, 4, 6, 10
Scaptomyza pallida (Zetterstedt)	C	—	S, Rt	3, 4, 6, 10
Otitidae				
Otitid larvae	M	—	S	6

Table 1. Continued.

	Relative frequency on			
	S. media	*S. graminea*	Plant part affected	Remarks
Stratiomyidae				
Stratiomyid larvae	M	—	S	6
Syrphidae				
Carposcalis obscurum (Say)	C	—	F	4, N
Eristalis arbustorum (L.)	—	R	F	6, N
Eristalis dimidiatus Wiedemann	—	C	F	6, N
Eristalis tenax (L.)	—	R	F	6, N
Helophilus fasciatus Walker	—	R	F	6, N
Helophilus latifrons Loew	—	R	F	6, N
Megasyrphus laxus (Osten Sacken)	—	M	F	6, N
Metasyrphus americanus (Weidemann)	R	—	F	3, N
Metasyrphus lapponicus (Zetterstedt)	—	M	F	6, N
Parhelophilus laetus (Loew)	—	R	F	6, N
Platycheirus quadratus Say	R	—	F	3, N
Sphaerophoria contigua (Macquart)	C	—	F	11, N
Sphaerophoria philanthus Meigen	R	C	F	4, 6, N
Syritta pipiens (L.)	—	M	F	6, N
Syrphus rectus Osten Sacken	—	M	F	6, N
Syrphus torvus Osten Sacken	—	M	F	6, N
Syrphus vitripennis Meigen	—	R	F	6, N
Toxomerus geminatus (Say)	—	R	F	6, N
Toxomerus marginatus (Say)	C	R	F	4, 6, N
Xylota hinei (Curran)	—	R	F	6, N
Tachinidae				
Epalpus signifer (Walker)	M	—	F	3
Gonia sp.	R	—	F	4
Gymnoclytia occidua (Walker)	—	R	F	6

Table 1. Continued.

	Relative frequency on			
	S. media	*S. graminea*	Plant part affected	Remarks
HEMIPTERA				
Lygus lineolaris (Palisot de Beauvois)	—	R	L, S, F	6
Mirid nymphs	C	R	L, S, F	6, 7, damage meristem
Pentatomidae				
Cosmopepla bimaculata (Thomas)	—	R	F	6
Pentatomid nymphs	C	R	L, S	7
HOMOPTERA				
Aphididae				
Acyrthosiphon sp.	—	R	L, S	6, 7
Acyrthosiphum sibericum (Mordv.)	M	—	L, S	4, 6
Aphidius sp.	C	—	L, S	4, 6
Aphidini nymphs	M	M	L, S	6
Aphis sp.	C	—	L, S	2
Aphis gossypii (Glover)	R	—	L, S	9, Pest
Dactynotus sp.	—	R	L, S	7
Hyalopterus pruni (Geoffroy)	R	—	L, S	4
Macrosiphini nymphs	M	R	L, S	6, 11
Macrosiphum euphorbiae (Thomas)	C	—	L, S	4, 6, 9, Pest
Myzus sp.	M	—	L, S	5
Myzus persicae (Sulzer)	C	—	L, S	2, 4, 5, 6, 7, 9, 10, 11, V, Pest
Rhopalosiphum maidis (Fitch)	R	—	L, S	11, Pest
Rhopalosiphum padi (L.)	C	—	L, S	10, 11
Schizaphis graminum (Rondani)	C	—	L, S	10, 11
Cercopidae				
Cercopid nymph	R	R	L, S	4, 9
Philaenus spumarius (L.)	R	C	S	6, Pest
Cicadellidae				
Agallia sp.	M	—	L, S	6
Agallia constricta (Provancher)	M	—	L, S	2, 4
Aceratogallia sanguinelenta Van Duzee	M	—	L, S	9
Cicadellid sp. nymphs	C	R	L, S	6, 7, 9, 11
Deltocephaline nymphs	M	—	L, S	7

Table 1. Continued.

	Relative frequency on			
	S. media	*S. graminea*	Plant part affected	Remarks
Doratura stylata (Boh.)	—	M	L, S	7
Empoasca sp.	R	M	L, S	9
Empoasca erigeron DeLong	R	—	L, S	6
Gyponine nymphs	R	—	L, S	6
HYMENOPTERA				
Andrenidae				
Andrena spp.	M	M	F	3, 4, 5, 6, 7, N
Andrena carlini Cockerell	C	—	F	4, N, P
Andrena dunningi Cockerell	—	R	F	6, N, P
Andrena sigmundi Cockerell	R	—	F	4, N, P
Andrena viburnella Graenicher	R	—	F	4, N
Andrena vicina Smith	C	—	F	4, N
Calliopsis andreniformis Smith	—	M	F	7, N, P
Anthophoridae				
Xylocopa virginica (L.)	M	—	F	3, N
Apidae				
Apis mellifera L.	M	—	F	4, N, P
Bombus bimaculatus Cresson	R	—	F	3, N
Bombus ternarius Say	—	M	F	7, N
Bombus terricola Kirby	—	M	F	7, N
Braconidae				
Chelonus sp.	—	R	F	6, N
Formicidae				
Camponotus noveboracensis (Fitch)	—	R	F	6, N
Formica subsericea Say	—	R	F	6, N
Leptothorax muscorum (Nylander)	—	M	F	7, N
Myrmica lobicornis fracticornis Emery	—	R	F	6, N
Prenolepis imparis (Say)	M	—	F	4, N
Tapinoma sessile (Say)	M	M	F	6, 7, N
Halictidae				
Dialictus lineatulus (Crawford)	—	M	F	7, N
Dialictus versatus (Robertson)	R	M	F	4, N

Table 1. Continued.

	Relative frequency on			
	S. media	*S. graminea*	Plant part affected	Remarks
Halictus confusus Smith	—	C	F	7, N
Halictus rubicundus (Christ)	—	R	F	7, N
Lasioglossum forbesii (Robertson)	—	R	F	7, N, P
Ichneumonidae				
Banchus flavescens Cresson	—	R	F	6, N
Exyston chlavatum (Cresson)	—	R	F	6, N
Megachilidae				
Osmia cornifrons (Radoszkowskii)	M	—	F	4, N, introduced
Pompilidae				
Anoplius sp.	—	M	F	6, 7, N
Vespidae				
Polistes fuscatus (F.)	R	—	F	3, N
LEPIDOPTERA				
Arctiidae				
Diacrisia sp. larvae	M	—	L, S	9
Coleophoridae				
Coleophora sp. larvae	—	R	L, S	6
Gelechiidae				
Stomopteryx sp.	R	—	Rt	4
Geometridae				
Eupathecia larvae	R	—	L, S	6
Geometrid larvae	R	—	L, S	9
Microlepidoptera adult	—	R	S	7
Noctuidae				
Amphipyra pyramidoides Guenée	R	—	L	5
Amathes badinodis (Grote)	R	—	L, S	4
Eupsilia sp. larvae	R	—	L, S	4
Euxoa sp. larvae	R	—	L, S	5
Lacinipolia sp. larvae	R	—	L, S	4
Noctuid larvae (1st instar)	C	—	L, S	4, 5
Plathypena scabra (F.) larvae	M	—	L, S	9
Plusiine larvae (1st instar)	R	—	L, S	4

Table 1. Continued.

	Relative frequency on			
	S. media	*S. graminea*	Plant part affected	Remarks
Pseudaplusia sp. larvae	R	—	L, S	10
Pyralidae				
Udea rubigalis (Guenée) larvae	M	—	L, S	6, 9, Pest
Tortricidae				
Sparganothis reticulana (Clemens)	R	—	L, S	9
Sparganothis sulphurana (F)	R	R	L, S	7
Tortricid larvae	—	R	L	6
ORTHOPTERA				
Gryllidae				
Anaxipha nymph	R	—	L	4
THYSANOPTERA				
Phlaeothripidae				
Haplothrips leucanthemi (Schrank)	M	—	F	5, Pest
Thripidae				
Anaphothrips obscurus (Mueller)	M	—	L, S	4, 5, 6
Aptinothrips rufus (Mueller)	M	—	L, S	6
Aptinothrips stylifer Trybom	—	R	L, S	6, Pest
Chirothrips sp.	—	R	L, S	6
Frankliniella fusca (Hinds)	C	—	L, S	4, 6, 9, 10, 11 V, Pest
Frankliniella tenuicornis (Uzel)	R	—	L, S	10, V, Pest
Frankliniella tritici (Fitch)	M	M	L, S	6, Pest
Limothrips cerealium (Haliday)	R	—	L, S	5
Taeniothrips atratus (Haliday)	M	—	L, S	6
Thrips physapus L.	R	—	L, S	6
Thrips tabaci Lindeman	M	—	L, S	4, 10, Pest
Tmetothrips subapterus (Haliday)	—	C	L, S	6, European species, new record for New World

male-sterile plants (perhaps triploids) growing among normal plants at Trudeau, N.Y. Light or temperature (10 to 30°C) alternation benefits germination (Andersen 1968). This species, although common in meadows in upstate New York and New England, is much less weedy and invasive than *S. media*.

Materials and Methods

Phytophagous insects, mites and pollinators of *S. media* and *S. graminea* were collected at 41 and 13 locations, respectively, in Maryland, Pennsylvania, New York and Vermont during four years (1975–1978). The insects were observed, then they were hand-picked, aspirated or netted from the plants in the field, and any feeding damage was noted. The plants were then cut or uprooted, placed in large plastic bags, removed from the bags in the laboratory, examined, and beaten against a white oilcloth to loosen clinging insects. The plants were then placed in large, clean, clear plastic bags with netting caps for development and emergence of additional insects. The bagged plants were kept in the laboratory for about a month or until they decomposed and insects ceased to emerge. *Stellaria media* was collected from pastures, lawns, dumps, fallow land, forest edges, roadsides, and at edges of fields planted to soybeans, tomatoes and alfalfa. *Stellaria graminea* was collected from pastures, meadows, hayfields and roadsides.

Results and Discussion

Phytophagous insects and mites, and pollinators associated with chickweed and stichwort are listed in Table 1. Relatively few insects were common to both species of *Stellaria*; this may be largely due to differences in plant habitat and seasonal occurrence, since most *S. media* was collected in spring to early summer in southern Maryland, and most *S. graminea* was collected in mid- to late summer in northern New York.

Stellaria media is an important reservoir of crop viruses, such as beet curly top, tomato spotted wilt (Miller et al. 1960), turnip mosaic (Citir and Varney 1974), beet mild yellows (Hartleb and Bauer 1977), nepoviruses (Hanada and Harrison 1977), carnation ringspot (Rudel et al. 1977), cucumber mosaic (Bruckart and Lorbeer 1976; Kazda and Hervert 1977) and others (Kavanagh 1974). It is probable that viruses and other pathogens overwinter in this plant, and in its seeds, to be transmitted to crops in the spring (Kavanagh 1974). Insects that are known to transmit these crop viruses (Carter 1962), and that were collected on *Stellaria* are indicated in Table 1. Included in Table 1 are 16 species of crop pests harbored by *S. media* and *S. graminea* and 57 pollinators, belonging primarily to the Apoidea, Syrphidae and Formicidae. *Tmetothrips subapterus* (Haliday), collected on *S. graminea* at Rew, Pennsylvania, represents the first record of this

European monotypic genus in the Western Hemisphere. It lives in *Stellaria* galls and may be worthy of further investigation as a biological control agent (K. O'Neill, pers. comm.).

Stellaria media is eaten to some extent by 35 species of North American wildlife (mainly birds, Martin et al. 1951), and it is palatable to livestock, with good caloric content in winter (Caspers 1977). However, in view of its importance as a major weed, its lack of close relationship to valuable plants, its exotic origin and consequent lack of stenophagy or dependence by North American wildlife, it may be worthwhile to begin a search for potential biological control agents in Eurasia. However, its winter annual growth habit and usual predominance in cultivated areas do not favor the application of biological control methods. Insects and pathogens that destroy the flowers and seeds of chickweed would probably be the most effective control agents.

Except for numerous *Dysonycha* sp. larvae that totally defoliated plants at one Beltsville location, and mirid nymphs that damaged the meristem (Table 1) native North American insects did not appreciably affect *S. media*, as was expected. This weed seems to be an important overwintering reservoir or winter food source for crop viruses and insect pests such as *Myzus persicae* (Sulzer). The flowers provide food for beneficial insects such as bees and syrphid flies during late fall and early spring when few other flowers are blooming.

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